1   1.   A method of determining a condition of a region of a tissue sample, said method

2   comprising the steps of:

3   (a)   obtaining a first set of spectral data corresponding to a region of a tissue

4   sample using light incident to said region at a first angle;

5   (b)   obtaining a second set of spectral data corresponding to said region using

6   light incident to said region at a second angle;

7   (c)   selecting at least one of said first set of spectral data and said second set of

8   spectral data that is representative of said region of said tissue sample; and

9   (d)   determining a condition of said region of said tissue sample based at least

10   in part on a subset of said at least one set of spectral data selected in step (c).

1   2.   The method of claim 1, wherein said first set of spectral data comprises

2   reflectance spectral data and said second set of spectral data comprises reflectance

3   spectral data.

1   3.   The method of claim 1, wherein said at least one of said first set of spectral data

2   and said second set of spectral data comprises fluorescence spectral data.

1   4.   The method of claim 1, further comprising obtaining a third set of spectral data

2   corresponding to said region using light incident to said region at a third angle.

1   5.   The method of claim 1, further comprising obtaining each of a plurality of sets of

2   spectral data in addition to said first set and said second set using light incident to said

3   region at a unique angle.

1   6.   The method of claim 1, wherein said condition is a state of health.

1 7.   The method of claim 6, wherein said state of health comprises at least one of the

2 conditions of normal squamous tissue, metaplasia, CIN I, CIN II, CIN III, CIS, and

3 cancer.

1 8.   A method of determining whether spectral data obtained from a region of a tissue

2 sample are affected by an artifact, said method comprising the steps of:

3   obtaining a first set of spectral data corresponding to a region of a tissue sample

4 using light incident to said region at a first angle;

5   obtaining a second set of spectral data corresponding to said region using light

6 incident to said region at a second angle; and

7   determining whether said first set of data is affected by an artifact based at least in

8 part on a subset of said first set of data and a subset of said second set of data.

1 9.   The method of claim 8, wherein said first set of spectral data comprises

2 reflectance spectral data and said second set of spectral data comprises reflectance

3 spectral data.

1 10.   The method of claim 8, further comprising obtaining a third set of spectral data,

2 where said third set of spectral data comprises fluorescence spectral data.

1 11.   The method of claim 8, wherein said determining step comprises computing a

2 difference between R_1, a member of said first set of spectral data, and R_2, a member of

3 said second set of spectral data, and comparing said difference to a constant, where R_1

4 and R_2 correspond to at least approximately identical wavelengths.

1 12.   The method of claim 11, wherein said difference is a percent difference.

1 13.   The method of claim 8, wherein said determining step comprises computing N

2 differences, $|R_1(X_i)-R_2(X_i)|$, optionally weighting each of said differences using at least

3   one of $R_1(X_i)$ and $R_2(X_i)$, defining a maximum of a subset of said N optionally-weighted

4   differences, and comparing said maximum to a first constant, where i = 1 to N, N is an

5   integer, X_i is a wavelength between about 360nm and about 720nm, $R_1(X_i)$ is a member

6   of said first set of data corresponding to said wavelength X_i, and $R_2(X_i)$ is a member of

7   said second set of data corresponding to said wavelength X_i.

1   14.   The method of claim 13, wherein said determining step further comprises

2   comparing $R_1(X_1)$ to a second constant, where $R_1(X_1)$ is a member of said first set of data

3   corresponding to a wavelength X_1 between about 409nm and about 429nm.

1   15.   The method of claim 8, wherein said determining step comprises comparing

2    $R_1(X_1)$ to a constant, where $R_1(X_1)$ is a member of said first set of data corresponding to a

3   wavelength X_1 between about 409nm and about 429nm.

1   16.   The method of claim 8, wherein said determining step comprises comparing the

2   quotient $R_1(X_1)/R_1(X_2)$ to a constant, where $R_1(X_1)$ is a member of said first set of data

3   corresponding to a wavelength X_1 between about 360nm and about 720nm, and $R_1(X_2)$ is

4   a member of said first set of data corresponding to a wavelength X_2 between about

5   360nm and about 720nm.

1   17.   The method of claim 16 wherein X_1 is a wavelength between about 489nm and

2   509nm and X_2 is a wavelength between about 533nm and about 553nm.

1   18.   The method of claim 13, wherein said determining step further comprises

2   comparing the quotient $\{(R_1(X_1)/R_2(X_1))/(R_1(X_2)/R_2(X_2))\}$ to a second constant, where

3   X_1 is a wavelength between about 360nm and about 720nm, X_2 is a wavelength between

4   about 360nm and about 720nm, $R_1(X_1)$ is a member of said first set of data corresponding

5   to said wavelength X_1, $R_2(X_1)$ is a member of said second set of data corresponding to

6   said wavelength X_1, $R_1(X_2)$ is a member of said first set of data corresponding to said

7   wavelength X_2, $R_2(X_2)$ is a member of said second set of data corresponding to said

8   wavelength X_2.

1   19.   The method of claim 18 wherein X_1 is a wavelength between about 566nm and

2   about 586nm, and X_2 is a wavelength between about 589nm and about 609nm.

1   20.   The method of claim 19, wherein said determining step further comprises

2   comparing $R_1(X_3)$ to a third constant, where $R_1(X_3)$ is a member of said first set of data

3   corresponding to a wavelength X_3 between about 689 and about 709nm.

1   21.   The method of claim 13, wherein said determining step further comprises

2   comparing a value Q to a second constant, where Q is an approximate slope of a plot of

3      $\{R_1(X_i)/R_2(X_i)\}$ with respect to wavelength, over a subset of a wavelength range of about

4   360nm to about 720nm.

1   22.   The method of claim 15, wherein said determining step further comprises

2   comparing a value Q to a second constant, where said value Q is an approximate slope of

3   a plot of $\{R_1(X_i)/R_2(X_i)\}$ with respect to wavelength, over a subset of a wavelength range

4   of about 576nm to about 599nm.

1   23.   The method of claim 13, wherein said determining step further comprises

2   comparing $R_1(X_1)$ to a second constant and comparing $R_1(X_1)$ to $R_2(X_1)$, where $R_1(X_1)$ is

3   a member of said first set of data corresponding to a wavelength X_1 between about

4   360nm and about 720nm, and $R_2(X_1)$ is a member of said second set of data

5   corresponding to said wavelength X_1.

1   24.   The method of claim 13, wherein said determining step further comprises

2   comparing $R_1(X_1)$ to a second constant and comparing $R_1(X_1)$ to $R_2(X_1)$, where $R_1(X_1)$ is

3   a member of said first set of data corresponding to a wavelength X_1 between about

4   489nm and about 509nm, and $R_2(X_1)$ is a member of said second set of data

5   corresponding to said wavelength X_1.

1   25.   The method of claim 18, wherein said determining step further comprises

2   comparing $R_1(X_3)$ to a third constant, where $R_1(X_3)$ is a member of said first set of data

3   corresponding to a wavelength X_3 between about 360nm and about 720nm.

1   26.   The method of claim 18, wherein said determining step further comprises

2   comparing $R_1(X_3)$ to a third constant, where $R_1(X_3)$ is a member of said first set of data

3   corresponding to a wavelength X_3 between about 409nm and about 429nm.

1   27.   The method of claim 8, wherein said determining step comprises comparing R_1 to

2   a first constant and comparing R_2 to a second constant, where R_1 is a member of said first

3   set of data corresponding to a wavelength between about 489nm and about 509nm and R_2

4   is a member of said second set of data corresponding to a wavelength between about

5   489nm and about 509nm.

1   28.   The method of claim 8, wherein said artifact comprises a lighting artifact.

1   29.   The method of claim 28, wherein said lighting artifact comprises glare.

1   30.   The method of claim 28, wherein said lighting artifact comprises shadow.

1   31.   The method of claim 8, wherein said artifact comprises an obstruction.

1   32.   The method of claim 31, wherein said obstruction comprises blood.

1   33.   The method of claim 31, wherein said obstruction comprises a portion of at least

2   one of a group consisting of a speculum and a smoke tube.

1   34.   The method of claim 31, wherein said obstruction comprises mucus.

1   35.   The method of claim 8, wherein said tissue sample comprises cervical tissue.

1 36.   The method of claim 8, wherein said tissue sample comprises epithelial cells.

1 37.   The method of claim 8, wherein said tissue sample comprises at least one of a

2 group consisting of colorectal, gastroesophageal, urinary bladder, lung, and skin tissue.

1 38.   A method of determining whether spectral data corresponding to a region of a

2 tissue sample is affected by an artifact, said method comprising the steps of:

3   obtaining a first set of reflectance spectral data corresponding to a region of a

4 tissue sample using light incident to said region at a first angle;

5   obtaining a second set of reflectance spectral data corresponding to said region

6 using light incident to said region at a second angle;

7   obtaining a set of fluorescence spectral data corresponding to said region; and

8   determining whether any of said first set of reflectance spectral data, said second

9 set of reflectance spectral data and said set of fluorescence spectral data are affected by

10 an artifact based at least in part on at least one of the following: a subset of said first set

11 of reflectance spectral data, a subset of said second set of reflectance spectral data, and a

12 subset of said set of fluorescence spectral data.

1 39.   The method of claim 38, wherein said determining step comprises comparing F to

2 a constant, where F is a member of said set of fluorescence spectral data corresponding to

3 a wavelength between about 469nm and about 489nm.

1 40.   A method of determining a spectral characteristic of an artifact, said method

2 comprising the steps of:

3   (a)   at each of a first plurality of regions of tissue, obtaining a first set of

4 reflectance spectral data affected by a known artifact;

5   (b)   at each of a second plurality of regions of tissue, obtaining a second set of

6   reflectance spectral data not affected by said known artifact; and

7   (c)   determining a spectral characteristic of said known artifact based at least

8   in part on said first set of spectral data and said second set of spectral data.

1   41.   The method of claim 40, wherein said determining step comprises locating a

2   wavelength at which there is a maximum difference between a mean of one or more

3   members of said first set corresponding to said wavelength and a mean of one or more

4   members of said second set corresponding to said wavelength, relative to a variation

5   measure.

1   42.   The method of claim 40, wherein said determining step comprises computing N

2   differences, $|\mu_i(A_j(X_i))-\mu_i(B_k(X_i))|$, and defining a maximum of a subset of said N

3   differences, where i = 1 to N, N is an integer, X_i is a wavelength between about 360nm

4   and about 720nm, j = 1 to M1, M1 is an integer, $A_j(X_i)$ represents one of M1 members of

5   said first set of reflectance spectral data corresponding to said wavelength X_i, k = 1 to

6   M2, M2 is an integer, $B_k(X_i)$ represents one of M2 members of said second set of

7   reflectance spectral data corresponding to said wavelength X_i, $\mu_i(A_j(X_i))$ is a mean of said

8   M1 members of said first set of data corresponding to said wavelength X_i, and $\mu_i(B_k(X_i))$

9   is a mean of said M2 members of said second set of data corresponding to said

10   wavelength X_i.

1   43.   The method of claim 40, wherein said determining step comprises computing N

2   quotients, $[|\mu_i(A_j(X_i))-\mu_i(B_k(X_i))| / \{\sigma_i^2(A_j(X_i))+\sigma_i^2(B_k(X_i))\}^{0.5}]$, and defining a maximum

3   of a subset of said N quotients, where i = 1 to N, N is an integer, X_i is a wavelength

4   between about 360nm and about 720nm, j = 1 to M1, M1 is an integer, $A_j(X_i)$ represents

5   one of M1 members of said first set of reflectance spectral data corresponding to said

6   wavelength X_i, k = 1 to M2, M2 is an integer, $B_k(X_i)$ represents one of M2 members of

7   said second set of reflectance spectral data corresponding to said wavelength X_i,

8     $\mu_i(A_j(X_i))$ is a mean of said M1 members of said first set of data corresponding to said

9   wavelength X_i, $\mu_i(B_k(X_i))$ is a mean of said M2 members of said second set of data

10   corresponding to said wavelength X_i, $\sigma_i(A_j(X_i))$ represents a standard deviation of said

11   M1 members of said first set of data corresponding to said wavelength X_i, and $\sigma_i(B_k(X_i))$

12   represents a standard deviation of said M2 members of said second set of data

13   corresponding to said wavelength X_i.

1   44.   The method of claim 40, wherein said determining step comprises computing N

2   quotients, $[|\mu_i(A_j(X1_i)/A_j(X2_i))-\mu_i(B_k(X1_i)/B_k(X2_i))| / \{\sigma_i(A_j(X1_i)/A_j(X2_i))+$

3     $\sigma_i^2(B_k(X1_i)/B_k(X2_i))\}^{0.5}]$, and defining a maximum of a subset of said N quotients, where

4   i = 1 to N, N is an integer, $X1_i$ is a wavelength between about 360nm and about 720nm,

5     $X2_i$ is a wavelength between about 360nm and about 720nm, j = 1 to M1, M1 is an

6   integer, $A_j(X1_i)$ represents one of M1 members of said first set of reflectance spectral

7   data corresponding to said wavelength $X1_i$, $A_j(X2_i)$ represents one of M1 members of

8   said first set of reflectance spectral data corresponding to said wavelength $X2_i$, k = 1 to

9   M2, M2 is an integer, $B_k(X1_i)$ represents one of M2 members of said second set of

10   reflectance spectral data corresponding to said wavelength $X1_i$, $B_k(X2_i)$ represents one of

11   M2 members of said second set of reflectance spectral data corresponding to said

12   wavelength $X2_i$, $\mu_i(A_j(X1_i)/A_j(X2_i))$ is a mean of M1 quotients $A_j(X1_i)/A_j(X2_i)$ for j = 1

13   to M1, $\mu_i(B_k(X1_i)/B_k(X2_i))$ is a mean of M2 quotients $B_k(X1_i)/B_k(X2_i)$ for k = 1 to M2,

14     $\sigma_i(A_j(X1_i)/A_j(X2_i))$ represents a standard deviation of said M1 quotients $A_j(X1_i)/A_j(X2_i)$,

15   and $\sigma_i(B_k(X1_i)/B_k(X2_i))$ represents a standard deviation of said M2 quotients

16     $B_k(X1_i)/B_k(X2_i)$.

1   45.   A method of determining a characteristic of a region of a tissue sample, said

2   method comprising the steps of:

3   (a)   obtaining a first set of reflectance spectral data corresponding to a region

4   of a tissue sample using light incident to said region at a first angle;

5   (b)   obtaining a second set of reflectance spectral data corresponding to said

6   region using light incident to said region at a second angle;

7   (c)   determining whether at least one of said first set of reflectance data and

8   said second set of reflectance data is affected by an artifact based at least in part on a

9   subset of said first set of reflectance data and a subset of said second set of reflectance

10   data;

11   (d)   rejecting at least one member of at least one of said first set of reflectance

12   data and said second set of reflectance data determined in step (c) to be affected by said

13   artifact; and

14   (e)   determining a characteristic of said region of said tissue sample based at

15   least in part on at least one member of at least one of said first set of reflectance data and

16   said second set of reflectance data not rejected in step (d).

1   46.   The method of claim 45, further comprising obtaining a set of fluorescence

2   spectral data corresponding to said region, and wherein step (e) comprises determining

3   said condition of said region of said tissue sample based at least in part on

4   at least one member of at least one of said first set of reflectance data and said

5   second set of reflectance data

6   and at least one member of said set of fluorescence spectral data.